CLAIMS

1. A laser processing method of irradiating a substrate having a front face formed with a laminate part including a plurality of functional devices with laser light while locating a light-converging point within the substrate so as to form a modified region to become a start point for cutting within the substrate along a line to cut of the substrate,

the method comprising the steps of:

forming a plurality of rows of first modified regions along the line to cut; and

forming at least one row of a second modified region along the line to cut at a position between the first modified region closest to a rear face of the substrate and the rear face, so as to generate a fracture extending along the line to cut from the second modified region to the rear face.

2. A laser processing method according to claim 1, wherein the substrate is a semiconductor substrate, and wherein the first and second modified regions include a molten processed region.

3. A laser processing method according to claim 1 or 2, wherein the first and second modified regions are successively formed one by one from the side farther from the rear face while using the rear face as a laser light entrance surface.

4. A laser processing method according to one of claims 1 to 3, wherein the laser light has an energy of 2 μJ to 50 μJ when forming the first modified regions.

5. A laser processing method according to one of claims 1 to 4, wherein the laser light has an energy of 1 μJ to 20 μJ when forming the

second modified region.

6. A laser processing method according to one of claims 1 to 5, wherein the laser light has a greater energy when forming the first modified regions than when forming the second modified region.

7. A laser processing method according to claim 6, wherein the energy of the laser light for forming the first modified regions is 1.6 to 3.0, where the energy of the laser light for forming the second modified region is taken as 1.

8. A laser processing method according to one of claims 1 to 7, wherein respective positions where the light-converging point of the laser light is located when forming neighboring first modified regions have a distance of 24 μm to 70 μm therebetween.

9. A laser processing method according to one of claims 1 to 8, wherein the light-converging point of the laser light is located at a position distanced by 50 μm to [(the substrate thickness) x 0.9] μm from the rear face when forming the first modified regions.

10. A laser processing method according to one of claims 1 to 8, wherein the light-converging point of the laser light is located at a position distanced by 20 μm to 110 μm from the rear face when forming the second modified region.

11. A laser processing method according to claim 1, wherein, when forming a plurality of rows of second modified regions, the laser light has a greater energy when forming the first modified regions than when forming the second modified region closest to the rear face of the substrate.

12. A laser processing method according to claim 11, wherein, when

forming a plurality of rows of second modified regions, the energy of the laser light for forming the second modified region farthest from the rear face of the substrate is 1.3 to 3.3, where the energy of the laser light for forming the second modified region closest to the rear face of the substrate is taken as 1.

13. A laser processing method according to claim 11, wherein, when forming a plurality of rows of second modified regions, the energy of the laser light for forming the first modified regions is 1.3 to 3.3, where the energy of the laser light for forming the second modified region closest to the rear face of the substrate is taken as 1.

14. A laser processing method according to claim 1, wherein, when forming a plurality of rows of second modified regions, a position where the light-converging point of the laser light is located when forming the second modified region closest to the rear face of the substrate is distanced from the rear face by 20 μm to 110 μm, and a position where the light-converging point of the laser light is located when forming the second modified region second closest to the rear face of the substrate is distanced from the rear face by 140 μm or less.

15. A laser processing method according to one of claims 1 to 14, further comprising the step of cutting the substrate and laminate part along the line to cut.

16. A semiconductor chip comprising a substrate; and a laminate part, disposed on a front face of the substrate, including a functional device;

wherein a plurality of rows of first modified regions extending along a rear face of the substrate are formed in a side face of the

substrate so as to be in series in a thickness direction of the substrate; and

wherein at least one row of a second modified region extending along the rear face is formed at a position between the first modified region closest to the rear face and the rear face in the side face.

17. A semiconductor chip according to claim 16, wherein the substrate is a semiconductor substrate, and wherein the first and second modified regions include a molten processed region.

18. A semiconductor chip according to claim 16 or 17, wherein an end part of the first modified region on the rear face side and an end part of the second modified region on the front face side opposing each other have a distance of 15 μm to 60 μm therebetween.

19. A semiconductor chip according to one of claims 16 to 18, wherein the first modified regions have a total width of 40 μm to [(the substrate thickness) x 0.9] μm in the thickness direction of the substrate.